

## CLAIMS

1. (Original) (Canceled) A variable valve gear comprising at least:

a casing; a cam shaft (1);

a control cam (2) mounted on said cam shaft (1);

a valve (4);

a valve actuator (5) for displacing said valve (4);

a roller (6);

a control shaft (7) rotatable about an axis (9) of said casing;

characterized in that:

the roller couples the control cam and the valve actuator and the control shaft,

the control cam displaces the roller, and the roller, supported on the control

shaft, displaces the valve actuator and the valve at a variable stroke

depending on the angular displacement of the control shaft,

thereby a simple, light, compact, precise, low friction, capable for high revs,

easy to adjust and easy to control continuously variable valve lift system, with

acceptably small valve clearance for all available valve lifts, can result.

2. (Original) (Canceled) As in claim 1 characterized in that:

the roller comprises pins and rings in order to reduce or eliminate the sliding of the roller on the members it couples.

3. (Original) (Canceled) As in claim 1 characterized in that:

the roller is cylindrical or spherical or barrel shaped or in general is a solid of revolution or comprises solids of revolution.

4. (Original) (Canceled) As in claim 1 characterized in that:

the roller is a free roller trapped among the control cam, the control shaft and the valve actuator.

5. (Original) (Canceled) As in claim 1 characterized in that:

the roller is only partially cylindrical or it is a fraction of a solid of revolution.

6. (Original) (Canceled) As in claim 1 characterized in that:

the roller is in direct contact to the control cam and to the control shaft and to the valve actuator.

7. (Original) (Canceled) As in claim 1 characterized in that:

the roller is a roller bearing rolling directly on some or all of the members it couples.

8. (Original) (Canceled) As in claim 1 characterized in that:

the axis of rotation of the control shaft and the axis of the roller are substantially offset to each other when, with the valve closed, the roller is in touch to the basic circle of the control cam, the roller is supported along a surface of the control shaft which comprises a lost motion initial part followed by an activation part, said lost motion initial part is substantially a surface of revolution with axis substantially coinciding the axis of rotation of the control shaft,

thereby a variable lift / variable duration / variable timing system results.

9. (Original) (Canceled) As in claim 1 characterized in that:

the rotation axis of the control shaft substantially coincides to the axis of the roller when, with the valve closed, the roller is in touch to the basic circle of the control cam,

thereby a variable valve lift with substantially constant duration, timing and clearance can result.

10. (Original) (Canceled) As in claim 1 characterized in that:

there is a lever swivelably coupled, at one end, to the valve actuator, and the lever holds, at its other end, the roller.

11. (Original) (Canceled) As in claim 1 characterized in that:

the profile of the contact surface between the control shaft and the roller, and the profile of the contact surface between the valve actuator and the roller are properly selected to provide the desirable range of valve lifts with acceptably small valve clearance.

12. (Original) (Canceled) As in claim 1 characterized in that:

the profile of the contact surface between the control shaft and the roller, and the profile of the contact surface between the valve actuator and the roller are properly selected to provide valve lifts from substantially zero to a maximum, with acceptably small valve clearance,

thereby a throttless system can result, as well as a system for deactivating some cylinders.

13. (Original) (Canceled) As in claim 1 characterized in that:

the profile of the contact surface between the control shaft and the roller, and the profile of the contact surface between the valve actuator and the roller are plane or cylindrical.

14. (Original) (Canceled) As in claim 1 characterized in that:

the roller is displaced by said control cam indirectly, through a linkage, thereby a high precision system can result, suitable for arrangements like the side cam engines.

15. (Original) (Canceled) A variable valve gear, comprising:

a cam shaft (1);

a control cam (2) mounted on said cam shaft (1);

a cam follower (33);

a valve (4);

a valve displacing device (5) for displacing said valve (4);

a valve lever (61) swivelably coupled to said valve displacing device (5);

a control lever (8) rotatable about an axis (9) and swivelably coupled to said valve lever (61) at a swivel joint (11);

an adjusting device for displacing said axis (9) along a path; the stroke of said valve (4) is variable according the displacement of said axis (9) along said path;

characterized in that:

the swivel joint (11) between said valve lever (61) and said control lever (8) is displaced by said control cam (2) indirectly through a linkage;

thereby a high precision system can result, especially suitable for arrangements like the side cam engines.

16. (New) A variable valve gear comprising at least:

a casing;

a cam (2) mounted on a camshaft (1) for rotation therewith;

a valve (4);

a valve actuator (5) for displacing said valve (4);

an angularly displaceable, about an axis (9) of said casing, control surface (7);

a roller (6);

characterized in that:

the roller (6) is arranged among the cam (2), the control surface (7) and the valve actuator (5) in substantially simultaneous abutment with all three of them;

the roller (6) is displaced along the control surface (7) under the camming action of the cam (2);

the valve actuator (5) is displaced by the roller (6);

and the valve (4) is displaced by the valve actuator (5) at a stroke which is variable depending on the angular displacement of the control surface (7).

17. (New) As in claim 16 characterized in that:

the roller is a substantially free roller trapped among the cam, the control surface and the valve actuator.

18. (New) As in claim 16 characterized in that:

the roller is only partially cylindrical or it has a fraction of a solid of revolution.

19. (New) A variable valve gear according claim 16 for operation with variable valve duration, characterized in that:

the control surface (7) comprises an initial lost motion part followed by an activation part;

the initial lost motion part substantially is a surface of revolution whose axis coincides the axis (9) about which the control surface (7) is angularly displaceable;

the axis (9) about which the control surface (7) is angularly displaceable and the axis of the roller (6) are substantially offset to each other when, with the valve (4) closed, the roller (6) is in touch to the basic circle region of the cam (2).

20. (New) A variable valve gear according claim 16, characterized in that:

the axis (9), about which the control surface (7) is angularly displaceable, substantially coincides to the axis of the roller (6) when, with the valve (4) closed, the roller (6) is in contact to the basic circle region of the cam (2).

21. (New) As in claim 16 characterized in that:

the control surface (7) and the surface (8) on the valve actuator (5) along which the roller (6) contacts the valve actuator (5) are plane or cylindrical.

22. (New) A variable valve gear comprising at least:

a casing;

a cam mounted on a camshaft for rotation therewith;

a valve;

a valve actuator for displacing said valve;

an angularly displaceable, about an axis of said casing, control surface;

a roller;

a lever;

characterized in that:

the roller is mounted at one end of the lever;

the lever is swivellably coupled, at its other end, to the valve actuator, with the swivel joint being a substantially non-moving swivel joint on the valve actuator; the roller is arranged between the cam and the control surface in substantially simultaneous abutment with both of them; the roller is displaced along the control surface under the camming action of the cam; the valve actuator is displaced by the roller, via the lever; and the valve is displaced by the valve actuator at a stroke which is variable depending on the angular displacement of the control surface.

23. (New) A variable valve gear comprising at least:

a casing;

a cam (2) mounted on a camshaft (1) for rotation therewith;

a valve (4);

a valve actuator (5) for displacing said valve (4);

an angularly displaceable, about an axis (9) of said casing, control surface (7);

a rocker (35) comprising a surface (37), the rocker (35) is pivotally mounted on said casing, the rocker (35) is driven by the cam (2) to pivot in an oscillatory manner;

a roller (6);

characterized in that:

the roller (6) is arranged among the surface (37), the control surface (7) and the valve actuator (5) in simultaneous abutment with all three of them;

the surface (37) of the rocker (35), under the camming action of the cam (2), displaces the roller (6) along the control surface (7);

the valve actuator (5) is displaced by the roller (6);

and the valve (4) is displaced by the valve actuator (5) at a stroke which is variable depending on the angular displacement of the control surface (7).

24. (New) As in claim 23 characterized in that:

the rocker (35) is connected to a first end of a push rod (34) which has a second end which engages the cam (2).

25. (New) A variable valve gear comprising:

a cam (2) mounted on a camshaft (1) for rotation therewith;

a cam follower (33);

a valve (4);

a valve displacing device (5) for displacing said valve (4);

a valve lever (61) swivellably coupled to said valve displacing device (5), with the swivel joint being a substantially non-moving swivel joint on said valve displacing device (5);

a control lever (8) rotatable about an axis (9) and swivelably coupled to said valve lever (61) at a swivel joint (11);

an adjusting device for displacing said axis (9) along a path;

the stroke of said valve (4) is variable according the displacement of said axis (9) along said path;

characterized in that:

the swivel joint (11) between the valve lever (61) and the control lever (8) is displaced by the cam indirectly through a linkage like "control cam to rocker to swivel joint" or like "control cam to push rod to rocker to swivel joint" and the known from the art.

26. (New) As in claim 16 characterized in that:

the roller comprises pins and rings in order to limit the sliding on the members it abuts, for the shake of friction reduction.